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GENETIC ANALYSIS FOR SOME QUANTITATIVE TRAITS IN YELLOW MAIZE VIA HALF DIALLEL DESIGN

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ABSTRACT

The utilization of diallel analysis for identification of superior hybrid combinations is a common practice in maize breeding programs. This methodology allows estimation of the combining ability of genotypes being evaluated. In this work, nine yellow inbred lines were evaluated for general (GCA) and specific (SCA) combining ability effects by using half diallel scheme. Thirty six F_1's produced among these parental lines were evaluated along with one commercial check cultivar at two locations; Sakha and Mallawy Agricultural Research Stations using a randomized complete block design with four replications. Traits analyzed were grain yield, days to mid-silk, plant height, ear height, ear length and ear diameter.

Significant differences were found for genotypes and locations for all traits. Genotypes × locations interaction was significant for all studied traits, except for days to mid-silk and ear diameter. Mean squares due to both GCA and SCA were significant or highly significant for all studied traits; with the former being more important in magnitude than the later, suggesting that additive genetic effects played an effective role in the inheritance of all studied traits, except ear diameter. Moreover, the magnitude of SCA × locations interaction was larger than GCA × Locations for grain yield and ear length while, the reverse was true for the remaining studied traits. Parents Sk-10 and Sk-7015 proved ideal general combiners for grain yield, ear length, ear diameter, and earliness, which were identified on the basis of desirable GCA effects. Cross combinations Sk-6001 × Sk10, Sk-6001 × Sk-7015, and Sk-9215 × Nu-218 were identified as the best crosses that showed, positive and significant estimates of SCA effects for high-yielding ability and exhibiting superiority over check cultivar SC155 for grain yield, earliness, and short plants. These promising crosses would be effective and fruitful in the future maize program for breeding high-yielding single and 3-way cross hybrids with ideal agronomic traits.

Key words: ***Maize, Zea mays, Diallel, GCA, SCA, Gene effects.***

INTRODUCTION

Diallel mating design has utility as a method to analyze crosses or parents with crosses for general (GCA) and specific (SCA) combining ability (Griffing 1956). This design provides information about the components of genetic variation, helps the breeder in the selection of desirable parents for crossing programs, and in deciding a suitable breeding procedure for genetic improvement of various quantitative traits. Sprague and Tatum (1942) defined general and specific combining ability and interpreted GCA as an indication of gene having largely additive effects and SCA as indication of gene having dominance and epistatic effects.

Furthermore, the performance of a hybrid is related to specific combining ability of the inbred lines involved in the cross. Therefore, the production of single cross hybrid necessitates selecting suitable parental lines and the best cross combinations for further use.

Both additive and non-additive genetic components with preponderance of additive gene action were observed in the inheritance of grain yield and its components by several investigators; among of them Has (1999), Ogunbodede *et al* (2000), Katna *et al* (2002), Wu *et al* (2003) and Motawei (2006). The same observation was noticed by Rodrigues and Silva (2002), Baoxian *et al* (2003) and Motawei (2006) for days to mid-silk, plant and ear height. Significant interactions of GCA and SCA variances with environmental conditions (E) were reported, however SCA × E was more pronounced than GCA × E (Aguiar *et al* 2003, Abd El-Maksoud *et al* 2004, Mosa and Motawei 2005 and Rather *et al* 2009) for grain yield and Amer (2002) and Mosa (2003) for ear length. Meanwhile, several investigators found that GCA variance was more affected and more sensitive to environmental conditions than that of SCA. Among these investigators, Nirala and Jha (2001) and Mosa and Motawei (2005) for days to mid-silk and plant height and Amer (2003), Abd El-Maksoud *et al* (2004) and El-Shenawy (2005) for ear height.

Economic Superiority of experimental hybrids relative to the commercial check cultivar was found in grain yield and other agronomic traits by Venugopal *et al* (2002), Yang *et al* (2003) and Motawei (2005, 2006).

The main objectives of this work were to examine the combining abilities and their interactions with locations of nine yellow maize inbred lines in a half diallel system and to identify promising yellow hybrids for yielding ability with suitable agronomic characters.

MATERIALS AND METHODS

Nine elite yellow inbred lines of maize (*zea mays* L.) were chosen for this study on the basis of their GCA effects for grain yield (Table 1).

Table1. Pedigree and origin of the nine parental inbred lines.

Name	Pedigree	Origin
P_1	Sk-5024	Exotic Eg-99 France
P_2	Sk-5026	SCSk-121xSd-318
P_3	Sk-6001	Compsite-21
P_4	Sk-9215	Exotic DMY-5703
P_5	Sk-8117	Exotic DMY-115
P_6	Sk-5027	Gm-1004xSk-6241
P_7	Sk-10	Exotic Ugo-2004
P_8	Sk7015	D.C. (Sk-121xSk-7266)x(B-73xGm-1021)
P_9	Nu-218	Nubaria-2007

One set of diallel crosses, excluding reciprocals were formed among these inbred lines at Sakha Agric. Res. St. during 2007 growing season. The resultant 36 F_1's along with SC155 as a check hybrid were evaluated at two locations; Sakha (North Egypt) and Mallawy (upper Egypt) using randomized complete blocks design (Steel and Torrie, 1980) with four replications during 2008 growing season. Plots were represented by one row; 6m long and 0.8 m apart with 25 plants per row. Cultural practices were applied as recommended at the two locations. Data were taken on the agronomic traits: number of days to mid-silk (DS), plant height (PH) in cm, ear height (EH) in cm and grain yield and its components: ear length (EL) and diameter (ED) in cm. Grain yield per plot was converted into grain yield in ardab/feddan (ard/fed), where one ardab =140 kg and one feddan = 4200m^2 and was adjusted on the basis of 15.5% grain moisture content.

Data were analyzed across two locations after testing the homogeneity of error mean squares according to Snedecor and Cochran, 1967.Combining ability variances and effects were calculated according to the method 4 model I (fixed model) of Griffing (1956). The hybrids effect was assumed to be fixed while; the locations effect was considered random.

Superiority of experimental hybrids over check cultivar (Sup. %) for days to mid-silk, plant height, ear height and grain yield was computed according to Meredith and Bridge (1972) as follows:

$$Sup.\% = \frac{\overline{F_1} - \overline{Mch}}{\overline{Mch}} \times 100$$

Where: $\overline{F_1}$ is the mean value of experimental hybrid and $\overline{Mch}$ is the mean value of the check cultivar.

RESULTS AND DISCUSSION

Combined analysis of variance for the six studied traits is presented in Table (2). Test locations (L) proved different as revealed by highly significant mean squares due to locations effect for all traits, indicating variation between the two locations in climatic conditions. Highly significant differences were detected among genotypes and variances due to their interaction with locations were significant for all traits except for DS and ED traits.

Mean squares due to combining abilities (Table 3) indicated that both GCA and SCA mean squares were significant or highly significant for all studied traits. This means that differences among parental lines for GCA and among crosses for SCA effects were obvious. Mean squares due to locations × GCA and locations × SCA interactions were highly significant for grain yield. Highly significant mean squares due to GCA×L interaction were also detected for PH and EH; and due to SCA × L interaction for EL.

Table 2. Combined analysis of variance for DS, PH, EH, GY, EL, and ED across locations.

S.O.V.	d.f	DS	PH	EH	GY	EL	ED
Location (L)	1	83.274**	142516.98**	62553.41**	6840.63**	254.56**	2.687**
Rep/L	6	12.247	1632.41	1119.95	26.08	2.95	0.132
Genotypes	36	14.736**	1022.1**	1038.03**	68.147**	6.995**	0.147**
Genotypes ×L	36	1.51	299.42**	346.353**	22.812**	2.627*	0.064
Error	216†	1.52	111.42	89.37	9.34	1.554	0.062
C.V%		2.07	4.2	6.5	10.4	6.6	5.2

*, ** Significant differences at 0.05 and 0.01 levels of probability, respectively.

Table 3. Mean squares from the diallel analysis for DS, PH, EH, GY, EL, and ED combined across locations.

S.O.V.	d.f	DS	PH	EH	GY	EL	ED
GCA	8	57.582**	3621.192*	3930.44*	192.36*	21.12**	0.281*
SCA	27	2.562*	229.183*	190.65**	33.296*	3.062*	0.109*
GCA × L	8	2.065	962.04**	1303.192**	35.03**	2.553	0.0845
SCA × L	27	1.27	111.096	74.182	16.818**	2.678*	0.0556

*, ** Significant differences at 0.05 and 0.01 levels of probability, respectively.

DS: number of days to mid-silk, PH: plant height (cm), EH: ear height (cm), GY: grain yield (ard/fed), EL: ear length (cm) and ED: ear diameter (cm).

Significant mean squares due to GCA and SCA interactions with locations are undesirable and suggest that both additive and non-additive gene action were less stable over environments. These results were in agreement with the studies of Matzinger *et al* (1959) and Gamma *et al* (1995).

Mean performance for the six studied traits are presented in Table (4). Number of days to mid-silk ranged from 57.1 (P7× P8) to 61.8 (P4 × P6) with an average of 59.4 days. Plant height ranged from 229.3 cm (P1 × P2) to 282.4 cm (P6 × P8) with an average of 252.0 cm and ear height ranged from 119.5 cm (P1 × P2) to 179.9 cm (P6 × P8) with an average of 144.5 cm. Meanwhile, grain yield ranged from 23.69 ard/fed (P2 × P4) to 35.51 ard/fed (P3 × P8) with an average of 29.5 ard/fed; ear length ranged from 16.6 cm (P2 × P5) to 20.5 cm (P1 × P7) with an average of 18.9 cm and ear diameter ranged from 4.55 cm (P2 × P8) to 5.23 cm (P6 × P7) with an average of 4.8 cm. Results also indicated that 14 out of 36 F_1s were earlier than the check hybrid and most crosses had shorter plant height and lower ear placement than the check hybrid. Moreover, 13 out of 36 F_1s were superior in yielding ability and most of them were earlier and had better plant type than the check hybrid SC155.

Table 4. Mean performance, Percentage of superiority of experimental hybrids over check cultivar 155 (Sup. %) and SCA effect for DS, PH, and EH combined across Sakha and Mallawy, 2008.

Genotype	Agronomic traits								
	DS			PH			EH		
	Mean (days)	Sup. %	SCA effects	Mean (cm)	Sup. %	SCA effects	Mean (cm)	Sup. %	SCA effects
P1 x P2	60.7	3.23*	-0.394	229.3	-13.8*	-3.19	119.5	-22.5*	-5.53*
P1 x P3	61.1	3.91*	0.045	239.1	-9.86*	-2.22	137.4	-10.9	0.39
P1 x P4	61.3	4.25*	-0.205	238.8	-10.0*	4.96	136.1	-11.7	6.67*
P1 x P5	61.6	4.76*	0.902*	240.2	-9.7*	1.71	139.8	-9.34	5.20
P1 x P6	61.7	4.93*	-0.705*	243.7	-8.4*	-2.54	141.1	-8.5	-2.82
P1 x P7	59.5	1.19	-0.634	242.0	-9.0*	-1.12	133.0	-13.7*	-0.07
P1 x P8	61.3	4.25*	1.169*	257.8	-3.1	2.15	146.4	-5.10	-4.49
P1 x P9	59.7	1.53	-0.188	242.8	-8.7*	0.26	136.1	-11.7	0.34
P2 x P3	59.2	0.68	-0.152	234.3	-11.95*	-10.44*	129.0	-16.3*	-6.92*
P2 x P4	60.0	2.04	0.102	235.5	-11.5*	-1.88	128.8	-16.5*	0.34
P2 x P5	58.2	-1.02	-0.795*	253.2	-4.8	11.24*	140.8	-8.7	7.25*
P2 x P6	61.0	3.74*	0.223	249.0	-6.4	-0.76	140.4	-8.9	-2.51
P2 x P7	59.2	0.68	0.795*	248.5	-6.63*	1.92	136.8	-11.3	4.74
P2 x P8	59.1	0.51	0.598	262.2	-1.4	3.06	154.4	0.13	4.56
P2 x P9	57.8	-1.70	-0.384	246.1	-7.52*	0.04	132.5	-14.1*	-2.23
P3 x P4	59.8	1.70	0.027	248.0	-6.8*	1.83	139.4	-9.6	-1.28
P3 x P5	59.0	0.34	0.009	255.4	-4.8	4.58	150.5	-2.4	4.75
P3 x P6	60.5	2.89*	-0.223	258.0	-3.0	-0.54	155.3	0.71	0.11
P3 x P7	58.1	-1.19	0.723*	265.0	-0.04	9.63*	147.4	-4.4	3.11
P3 x P8	58.0	-1.36	-0.473	261.6	-1.6	-6.65*	155.1	0.58	-6.94*
P3 x P9	58.2	-1.02	-0.045	258.3	-2.9	3.51	153.8	-0.26	6.77*
P4 x P5	59.1	[illegible]	-0.366	241.7	-9.1*	-1.62	135.0	-12.5	-3.23
P4 x P6	61.8	5.10*	0.651	246.8	-7.4*	-4.24	143.8	-6.7	-3.87
P4 x P7	59.4	1.02	0.473	241.3	-9.3*	-6.66*	133.5	-13.4*	-3.25
P4 x P8	58.3	-0.85	-0.598	262.2	-1.4	1.71	155.8	1.04	1.20
P4 x P9	58.6	-0.34	-0.080	253.2	-4.8	5.81	142.9	-7.33	3.42
P5 x P6	61.0	3.74*	0.634	254.1	-4.5	-1.62	151.8	-1.56	-0.96
P5 x P7	57.6	-2.04*	-0.419	251.0	-5.6	-1.56	137.5	-10.8	-4.34
P5 x P8	58.0	-1.36	-0.116	260.3	-2.3	-4.92	154.9	0.46	-4.76
P5 x P9	58.0	-1.36	0.152	244.3	-8.3*	-7.81*	140.6	-8.82	-3.92
P6 x P7	59.0	0.34	-0.777*	261.1	-1.8	0.81	152.4	-1.17	1.15
P6 x P8	59.7	1.53	-0.098	282.4	5.7	9.46*	179.9	16.7*	10.8*
P6 x P9	59.8	1.70	0.295	259.3	-2.6	-0.56	152.0	-1.43	-1.94
P7 x P8	57.1	-2.89*	-0.402	266.3	0.00	-3.49	158.5	2.79	0.34
P7 x P9	57.5	-2.21*	0.241	257.0	-3.4	0.37	141.4	-8.30	-1.69
P8 x P9	57.2	-2.72*	-0.080	267.6	0.04	-1.62	160.1	3.83	-0.75
SC155	58.8	-	-	266.1	-	-	154.2	-	-
L.S.D. at 0.05	1.24	-	-	17.49	-	-	18.81	-	-
L.S.D for S_{ij} at 0.05	-	-	0.708	-	-	6.62	-	-	5.41

*** Significant difference at 0.05 level of probability**

Superiority of experimental hybrids relative to the check hybrid SC155 for DS, PH, EH and GY revealed that SC P7 × P8, P7 × P9 and P8 × P9 exhibited negative (favorable) and significant values toward earliness. Meanwhile, 16 single crosses for plant height and 6 F_1s for ear height had negative and significant values toward short plant and low ear placement (Table 4). Single crosses, P3 × P7 and P3 × P8 had the highest positive and significant values for grain yield (15.78 and 16.05%, respectively) compared to SC155 (Table 5). In contrast, four single crosses viz. P4 × P8 (9.77%), P6

Table 5: Mean performance, Percentage of superiority of experimental hybrids over check cultivar 155 (Sup. %) and SCA effect for DS, PH, and EH combined across Sakha and Mallawy, 2008.

Genotype	Grain yield and yield component traits								
	GY			EL			ED		
	Mean ard/fed	Sup. %	SCA effects	Mean (cm)	Sup. %	SCA effects	Mean (cm)	Sup. %	SCA effects
P1 x P2	25.53	-16.57*	-1.111	18.2	-3.2	-0.68	4.73	-3.9	0.04
P1 x P3	31.25	2.12	0.587	18.6	-1.1	-0.30	4.75	-3.6	-0.03
P1 x P4	29.61	-3.23	0.554	19.7	4.8	0.54	4.73	-3.9	-0.04
P1 x P5	25.76	-15.81*	-0.255	18.7	-.053	0.26	4.78	-2.8	0.01
P1 x P6	29.83	-2.51	-0.061	19.3	2.66	-0.50	4.98	1.20	0.09
P1 x P7	32.33	5.65	1.318	20.5	9.04*	0.44	4.93	0.20	0.01
P1 x P8	30.84	0.78	-0.543	20.4	8.51	0.67	4.75	-3.6	-0.06
P1 x P9	28.52	-6.8	-0.488	19.8	5.3	-0.42	4.78	-2.8	-0.01
P2 x P3	29.99	-1.99	1.567	18.2	-3.2	0.36	4.9	-0.41	0.21*
P2 x P4	23.69	-22.6*	-3.13	18.2	-3.2	0.08	4.58	-6.9*	-0.10
P2 x P5	26.87	-12.19	3.09*	16.6	-11.7*	-0.75	4.73	-3.6	0.05
P2 x P6	29.34	-4.12	1.69	19.1	1.6	0.37	4.7	-4.5	-0.10
P2 x P7	26.25	-14.2*	-2.53	19.8	5.3	0.86	4.83	-1.8	-0.01
P2 x P8	28.41	-7.2	-0.74	18.2	-3.2	-0.53	4.55	-7.5*	-0.17*
P2 x P9	27.94	-8.69	1.17	19.5	3.7	0.28	4.75	-3.6	0.07
P3 x P4	30.06	-1.76	0.78	18.2	-3.2	0.05	4.9	0.41	0.13
P3 x P5	26.46	-13.53	-1.34	16.9	-10.1*	-0.38	4.8	-2.4	0.03
P3 x P6	31.76	3.79	0.09	17.7	-5.9	-1.07*	4.78	-2.8	-0.12
P3 x P7	35.43	15.78*	2.63*	19.9	5.9	0.99	4.85	-1.4	-0.08
P3 x P8	35.51	16.05*	2.74*	18.9	0.53	0.21	4.80	-2.4	-0.01
P3 x P9	25.69	-16.04*	-5.10	19.3	2.22	0.15	4.65	-5.5*	-0.14*
P4 x P5	25.69	-16.05*	-0.50	17.8	-5.3	0.19	4.85	-1.4	0.09
P4 x P6	29.21	-4.54	-0.86	19.1	1.6	0.12	4.9	-0.41	0.02
P4 x P7	30.28	-1.05	-0.91	18.1	-3.7	-1.10*	4.98	1.2	0.07
P4 x P8	33.59	9.77	2.04	19.1	1.6	0.12	4.68	-4.8	-0.13
P4 x P9	32.77	7.09	3.58*	19.4	-1.1	-0.02	4.75	-3.5	-0.03
P5 x P6	25.55	-16.50*	-1.48	18.6	-1.1	0.36	4.8	-2.4	-0.08
P5 x P7	28.41	-7.16	0.26	18.9	0.53	0.47	4.7	-4.5	-0.21*
P5 x P8	27.06	-11.57	-1.46	17.8	-5.3	-0.42	5.0	1.6	0.19*
P5 x P9	27.84	-9.02	1.69	18.9	0.53	0.27	4.7	-4.5	-0.08
P6 x P7	33.32	8.89	1.29	19.8	5.3	-0.01	5.23	6.3*	0.19*
P6 x P8	32.87	7.42	0.48	20.4	8.5	0.77	4.98	1.2	0.05
P6 x P9	28.87	-5.65	-1.16	19.9	5.9	-0.06	4.85	-1.4	-0.05
P7 x P8	31.26	2.16	-2.26	18.7	-0.53	-1.12*	4.93	0.20	-0.03
P7 x P9	31.33	2.39	0.19	19.7	4.8	-0.53	5.0	1.6	0.07
P8 x P9	31.65	3.43	0.13	20.3	8.0	0.31	4.98	1.2	0.16*
SC155	30.6	-	-	18.8	-	-	4.92	-	-
L.S.D. at 0.05 between two means	4.82	-	-	1.64	-	-	0.25	-	-
L.S.D at 0.05 for S_{ij} from zero	-	-	2.57	-	-	1.02	-	-	0.14

* Significant difference at 0.05 level of probability

× P7 (8.89%), P6 × P8 (7.42%) and P4 × P9 (7.09%) had positive and high values for grain yield but did not differ significantly from the check hybrid 155. The highest values for ear length and ear diameter were detected for P1 × P7 and P6 × P7, respectively. According to the results, five crosses i.e. P3 × P7, P3 × P8, P4 × P8, P4 × P9 and P6 × P7 had the most favorable values for earliness, short plant, low ear placement as well as superior grain yield as compared with the commercial check hybrid SC155.

Estimates of SCA effects for the six studied traits of the 36 crosses (Tables 4&5), revealed that P3 × P8 was the most superior cross in terms of greater grain yield, shorter plant with low ear placement and early flowering. Moreover, SC P3 × P7, P4 × P9 and P2 × P5 exhibited positive and significant values of SCA effects for grain yield. Cross P2 × P5 showed also negative and significant estimate of SCA effects towards earliness. Developing hybrids for earliness and short plant together with high yield is one of the major objectives of maize breeding program. Thus the crosses P3 × P8 and P4 × P9 are the best combinations for this purpose in the present study.

Estimates of general combining ability effects for the six studied traits are found in Table (6). Inbred line P1 was an ideal general combiner for both PH and EL. On the other hand, inbred line P7 and P8 were identified as good combiners to the suitable inbred lines for earliness, high yielding ability, ear length, and ear diameter. In addition, parent P6 for ear diameter and P9 for earliness and ear length had favourable alleles for these traits. These results suggested that it could be possible to use the previous inbred lines in maize breeding program for improving these traits.

Table 6: General combining ability effects for DS, PH, EH, GY, EL, and ED combined across two locations.

Inbred lines		Agronomic traits			Yield component traits		
		DS	PH	EH	GY	EL	ED
P1		1.694*	-11.260*	-9.236	-0.295	0.495*	-0.022
P2		0.0159	-7.796	-10.289	-2.531*	-0.528*	-0.115*
P3		-0.0377	0.990	1.960	1.491	-0.541*	-0.019
P4		0.462*	-6.439	-5.558	-0.119	-0.293	-0.029
P5		-0.395	-1.814	-0.468	-3.154*	-1.039*	-0.029
P6		1.337*	5.937	8.925	0.717	0.318	0.092*
P7		-0.984*	2.758	-1.950	1.841*	0.508*	0.124*
P8		-0.913*	15.365*	15.853*	2.208*	0.322	0.014
P9		-1.180*	2.258	0.764	-0.158	0.758**	-0.015
LSD at 0.05 for	g_i	0.417	9.011	10.49	1.72	0.464	0.084
	g_i-g_j	0.626	13.517	15.732	2.579	0.696	0.127

* Significant difference at 0.05 level of probability.

Additive and non-additive genetic variances and their interaction with locations are shown in Table (7). K^2GCA, which reflected additive gene action, represented the effective and important contribution to the total genetic variance (from 57.7 to 86.8%) in the inheritance of all studied traits, except for ED (36.4%). Numerous investigators (among them Ogunbodede *et al* 2000, Katna *et al* 2002, Wu *et al* 2003 and Motawei 2006 for GY and EL and Rodrigues and Silva 2002, Baoxian *et al* 2003 and Motawei 2006 for DS, PH and EH) reported that additive gene action represented the major role in the inheritance of these traits.

Table 7. Additive and non-additive genetic variance for DS, PH, EH, GY, EL and ED.

Genetic component	Agronomic traits			Yield component traits		
	DS	PH	EH	GY	EL	ED
K^2GCA	0.991	47.48	46.9	2.81	0.33	0.004
K^2SCA	0.162	14.76	14.56	2.06	0.050	0.007
$\sigma^2GCA \times L$	0.019	30.32	43.30	0.915	0.121	0.003
$\sigma^2SCA \times L$	0.00	0.00	0.00	1.85	0.272	0.00
$\%K^2GCA/K^2GCA+K^2SCA$	85.9	76.3	76.3	57.7	86.8	36.4

On the other hand, the magnitude of σ^2_{SCA} x locations interaction was larger than σ^2_{GCA} x locations for GY and EL while, the reverse was true for the remaining studied traits. Abd El-Maksoud *et al* (2004), Aguiar *et al* (2003), Mosa and Motawei (2005) and Rather *et al* (2009) for GY and Amer (2002) and Mosa (2003) with respect to EL found that non additive gene effect was more interacted with environment rather than that additive type of gene action. In contrast, other investigators such as Nirala and Jha (2001), Mosa and Motawei (2005) for days to mid-silk and plant height, Amer (2003), Abd El-Maksoud *et al* (2004) and El-Shenawy (2005) for ear height found that σ^2_{GCA} x L interacted more than σ^2_{SCA} x L.

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التحليل الوراثي لبعض الصفات الكمية باستخدام نظام الداياليل فى الذرة الشامية الصفراء

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استخدام تحليل الديالل للتعرف على التراكيب الوراثية الممتازة من التطبيقات الشائعة فى برامج تربية هجن الذرة الشامية وذلك لقياس القدرة على الائتلاف للتراكيب الوراثية تحت التقييم، حيث تم التهجين التبادلى بين تسع سلالات صفراء لقياس القدرة الخاصة والعامة على الائتلاف باستخدام تحليل الديالل موسم 2007. ثم قيمت الـ 36 هجين فردى الناتجة مع هجين المقارنة فى محطتى البحوث الزراعية بسخا وملوي (موسم 2008) باستخدام تصميم القطاعات الكاملة العشوائية فى أربع مكررات. الصفات التى تم تحليلها هي تاريخ ظهور حرائر 50% من النورات المؤنثة، ارتفاع النبات، ارتفاع الكوز، محصول الحبوب، طول الكوز، قطر الكوز. تم تحليل الديالل طبقا لطريقة جريفنج الرابعة موديل-1 (النموذج الثابت).

وجدت اختلافات معنوية بين التراكيب الوراثية تحت الدراسة وكذلك بين المواقع لكل الصفات المدروسة. كذلك وجد ان التباينات الراجعة لتفاعل التراكيب الوراثية مع المواقع كانت معنوية لكل الصفات تحت الدراسة فيما عدا صفة تاريخ ظهور 50% من النورات المؤنثة وقطر الكوز. أشارت النتائج بان هناك اختلافات معنوية للتباينات الراجعة للقدرة العامة والخاصة على الائتلاف لكل الصفات المدروسة مع وجود أهمية اكبر للقدرة العامة عن القدرة الخاصة على الائتلاف وذلك فى سلوك كل الصفات مشيرا إلى أن التأثيرات الوراثية المضيفة للجين لعبت الدور المؤثر فى وراثة الصفات فيما عدا صفة قطر الكوز. ومن ناحية أخرى أظهرت النتائج بان سلوك الفعل الوراثى الغير مضيف وتفاعله مع المواقع كان أكثر تأثرا من الفعل الوراثي المضيف لصفة محصول الحبوب وطول الكوز بينما كان العكس صحيحا لباقي الصفات المدروسة.

أظهرت السلالة سخا-١٠ والسلالة سخا ٧٠١٥ تأثيرات مرغوبة للقدرة العامة على الائتلاف لصفات المحصول و طول الكوز وقطر الكوز والتبكير. كما أظهرت الهجن الفردية التجريبية سخا-٦٠٠١ × سخا-١٠ ، سخا-٦٠٠١ × سخا-٧٠١٥، سخا-٩٢١٥ × نوبارية-٢١٨ تأثيرات مرغوبة ومعنوية للقدرة الخاصة على الائتلاف وذلك لصفة المحصول بجانب إظهارها تميزاً عن هجين المقارنة في اتجاه التبكير وقصر النبات ومحصول الحبوب مما يشير إلى أن هذه الهجن الجديدة من المتوقع أن تكون مؤثرة ومثمرة في برنامج الذرة الشامية للتربية للقدرة المحصولية العالية مع تميزها في الصفات الخضرية حيث ظهر تفوق هذه الهجن في محصولها علي صنف المقارنة (هجين فردي جيزة ١٥٥).

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